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“Causes” Of Pesticide Safety Behavior Change in Latino Farmworker Families

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Abstract

Objective—To identify the source of behavior change resulting from a health education intervention focused on pesticide safety.

Methods—Data were from the La Familia Sana demonstration project, a promotora-delivered pesticide safety education intervention conducted with immigrant Latinos (N = 610).

Results—The La Familia Sana program produced changes in 3 sets of pesticide safety behaviors. Changes in the conceptual targets of the intervention and promotora attributes explained 0.45–6% and 0.5–3% of the changes in pesticide-related behavior, respectively.

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Human Subjects Statement
All sampling, recruitment, and data collection activities were executed in a manner consistent with standards for human subjects research. All procedures were approved by the Wake Forest School of Medicine Institutional Review Board.

Conflict of Interest Statement
The authors have no conflicts of interest to disclose.

Discussion—The conceptual targets of the La Familia Sana program explained the greatest amount of change in pesticide-related behavior. Promotora attributes also contributed to intervention success

Keywords

pesticide safety; Latinos; Immigrants; lay health advisors; translational research

Understanding how behavioral interventions create change is a fundamental ingredient for translating public health and safety intervention research into everyday practice. An underrecognized truism of intervention effectiveness is that an intervention's potential to create behavioral change is affected by at least 3 factors. The first factor is the appropriateness of the conceptual target of the intervention. Successful interventions are built around theoretically informed "conceptual targets" or factors that are believed to be the most important lever(s) for change.[1] Common conceptual targets based on health behavior theory include health knowledge, the perceived severity of health threats or consequences of unchanged behavior, and participants' beliefs about their ability to change behavior.[2] Basic capacities of the target population can influence the effectiveness of a proven intervention. Finally, qualities of the intervention vehicle shape the effectiveness of an intervention.

Delineating the relative importance of each set of factors to an intervention's success is an important step for program refinement and dissemination, especially when the intervention is a lightly controlled program like a demonstration project. If an intervention's success is driven by participants' capacity for change, program implementers may need to spend more time targeting the intervention to specific subgroups of the population or investing in supplemental programming to prepare the target population so they are better able to change. By contrast, program implementers can have greater confidence in disseminating the program to wider audiences if the intervention's conceptual targets drive its success.

The goal of this study is to inform effective dissemination of health and safety interventions into public health practice. The assumptions underlying this goal are that effective dissemination of interventions requires knowing that an intervention works under heavily controlled research conditions and understanding of the factors that contribute to intervention effectiveness in minimally controlled contexts. Disaggregating the sources of behavior change observed in a minimally controlled intervention is useful for public health professionals as they shape program implementation in "real world" contexts. Therefore, this analysis uses pre- and posttest evaluation data from a demonstration project for pesticide safety behaviors among family members of immigrant Latino farmworkers to (1) quantify the proportion of change variance in pesticide safety behaviors attributed to changes in the conceptual targets of the intervention (ie, improvements in pesticide knowledge, greater recognition of dangers of pesticides, enhanced pesticide safety efficacy); (2) quantify the proportion of change variance in pesticide safety behavior attributed to personal attributes reflecting individuals' capacity for change; and (3) quantify the proportion of change variance in pesticide safety behavior attributed to variation in the intervention vehicle, in this case a lay health advisor or *promotora*.

METHOD

Procedures

The data for this analysis are from a demonstration project evaluating the feasibility of using the *La Familia Sana* program as a public health tool to promote pesticide safety knowledge among migrant and seasonal farmworker families.[3,4] The demonstration project involved a partnership of the North Carolina Farmworkers Project (NCFP), which was responsible for implementing the *La Familia Sana* program, and Wake Forest School of Medicine (WFSM), which was responsible for evaluation. The NCFP implemented the *La Familia Sana* program through 6 agencies serving a total of 13 counties in east central North Carolina. The project goal was to enroll and educate participants from 600 families over 18 months (April 2009 – September 2010). To be eligible to participate, the participant had to be at least 18 years of age or married, self-identify as Latino or Hispanic, live in a household containing at least one farmworker employed in agriculture during the past 12 months, and plan to stay in the dwelling for the next 2 months. One adult in the household had to be pregnant or have at least one child 12 years of age or younger living in the dwelling. All study procedures were approved by the Wake Forest University Health Sciences Institutional Review Board.

La Familia Sana has been described elsewhere,[5] but is summarized here to provide context for the study. The program consists of 6 pesticide safety education lessons taught by a *promotora* through a minimum of 5 home visits. Topics for the 6 lessons are (1) protection of the family by knowing pesticide exposure symptoms and long-term consequences, (2) pesticide residues and paraoccupational exposure pathways, (3) exposure reduction to agricultural pesticides at home, (4) integrated pest management (IPM) at home, (5) pesticide risks for pregnant women and young children, and (6) persuasion of others to change behavior. The Health Belief Model (HBM)[6] provided the theoretical foundation for the overall project. The content of each *La Familia Sana* lesson focused on increasing participant's knowledge about pesticides and providing and practicing concrete strategies for reducing pesticide exposure.

The "knowledge" component of the lessons targeted several of the HBM's main concepts (italicized). For example, *perceived severity* was targeted in the first lesson by conveying that research has linked pesticide exposure with a variety of long-term health outcomes like cancer, memory and learning impairment, and sterility.[7,8] Similarly, the fifth lesson targeted *perceived severity* by highlighting the link between pesticide exposure and congenital anomalies in children[9] and explaining that the health effects of pesticide exposure are compounded in fetuses and small children due to their small size and rapid development.[10] *Perceived susceptibility* was conveyed in several lessons through descriptions of pesticide residues and activities that showed participants everyday places children come into contact with pesticides. Similarly material in lesson 6 addressed a common *perceived barrier* confronted by women in farmworker households, facilitating behavior change in the men living with them. The concrete strategies introduced in each lesson targeted *perceived benefits* that have strong face validity (if one deep cleans a house, one can reduce pesticide exposure) or are advocated in WPS training (eg, washing work clothes separately from nonwork clothes). Each lesson targeted *self-efficacy* through the liberal use of reflection points, role-plays and activities designed to help participants integrate advocated pesticide safety practices into daily life. The intervention itself was a cue to action to promote pesticide safety behavior, as were several of the concrete strategies for reducing exposure. For example, one suggestion in lesson 2 was to place a mat outside the door as a visual reminder (ie, cue to action) that work boots should be removed before entering the home.

Evaluation

Pre- and posttest interviewer-administered survey questionnaires were constructed with a total of 68 items designed to elicit knowledge or self-reported practices related to the lesson objectives. Both the pre- and posttest questionnaires were piloted on a small group of women in Latino farmworker families and revised based on feedback from the pilot. Because the vast majority of the questions are about concrete behaviors with discrete answers as opposed to abstract latent constructs, pilot testing revealed little difficulty understanding the intended meaning of the questions or issues articulating a response. Pretest interviewer-administered survey questionnaires were conducted with program participants prior to their receiving any lessons from the *promotoras*. Posttests interviews were conducted after all *promotora* lessons had been completed. Participants received $10 after completing the pretest and $20 after the posttest.

Seven interviewers identified with the help of liaisons collected all evaluation data. All interviewers were native Spanish-speakers, several had prior experience conducting survey interviews, and all were trained for this study. The interviewers field-edited the completed interviews before leaving the participant’s homes. WFSM staff reviewed the interview with the interviewer when collecting it in the field. Two Spanish-speaking staff prior to data entry also reviewed interviews, and any inconsistencies or queries were returned to the interviewer to clarify.

Measures

Dependent variables—Three distinct pesticide safety behaviors were operationalized: use of integrated pest management (IPM), adherence to recommendations provided by the US Environmental Protection Agency’s *Worker Protection Standards* (WPS), and safe home storage of pesticides. Measures used to operationalize each of these safety behaviors were developed for use in this study.

Use of integrated pest management (IPM), which refers to limited use of pesticides and the use of nonpesticide alternatives to eliminate household pests, was assessed with 10 self-reported items. The items captured the elimination of food and water sources for pests (eg, clean up spilled food and drinks right away) and the maintenance of the structural integrity of the home (eg, patch screens). For each of the 10 questions, a “correct” response was coded as 1 and an “incorrect” response coded as 0. The coded answers were then summed, and a percentage correct was calculated across all 10 questions. Adherence to WPS recommendations was assessed with 4 questions about behaviors advocated by the Environmental Protection Agency to protect workers from pesticide exposure by (1) changing out of work clothes outside the home, (2) showering immediately after completing work in the fields, (3) storing soiled work clothes until laundered, and (4) effectively laundering pesticide-exposed work clothes. Questions relevant to each of these behaviors were asked of the participant, who responded for both her- or himself and the spouse. For each of the 4 questions, if the actions of either the respondent or the spouse were incorrect, the household was considered as not meeting the WPS-recommended practice for that question. The coded household responses for all 4 questions were then summed and a percentage correct was calculated. Safe storage of pesticides was based on observational data and was focused primarily on reducing children's exposure to pesticides and also protecting adults. Interviewers asked participants to show where different types of common household pesticides were kept. Interviewers documented the location and circumstances surrounding the storage of each of 5 pesticides (ie, chlorine bleach, bug sprays, insect foggers, weed killers, and rodent killers). Storage of each, including "not in the house," was coded as either correct or incorrect, based on access to the pesticide by children. The coded responses for all 5 questions were then summed and a percentage correct was calculated.

Independent variables—Three classes of independent variable were operationalized. The first class included 3 variables reflecting the conceptual targets of the intervention. Pesticide knowledge was assessed with a series of questions about specific aspects of pesticides and pesticide safety relevant to 17 *a priori* learning objectives across all 6 lessons. Question responses were coded as 1 if the learning objective was met and zero otherwise. A summary measure for pesticide knowledge was created for the pretest and posttest by summing across the coded responses for all 17 learning objectives.

Perceived dangerousness of pesticides was assessed with single item asking, "How dangerous do you think pesticides are?" Response options ranged from not at all dangerous (1) to extremely dangerous (4). Pesticide self-efficacy was assessed with 3 questions (eg, "How confident are you that you can keep pesticides out of your home?"). Response options ranged from not at all confident (0) to very confident (2). Responses were averaged with higher values indicating greater confidence (α = 0.82 pretest, 0.88 posttest).

Participant attributes were age (15–24, 25–29, 30–34 and 35+), educational attainment (< 5th grade, 6th–8th grade, 9th–11th grade, > 12th grade), language preference (English, Spanish, Mixteco, other), and years in the United States (< 4, 5–9, and > 10). These demographic characteristics were presumed to be proxies for participants' ability to receive, understand, and use the information contained in the *La Familia Sana* program. Participants' active involvement in the material was assessed indirectly with 2 questions. The first question asked: "How much time did you spend looking at the written information provided by the *promotora*?" Possible response options ranged from none/never read them to a lot/read them closely and still sometimes refer to them. Responses were used to create a dichotomous variable reflecting having engaged with the written materials if participants reported "some" or "a lot", as opposed to not (responses of "never" or "a little"). Similarly, participants were asked if they watched the provided videos again after the promotora left. Participants indicating "yes" were coded 1 as having had an extra review of the video and zero otherwise.

Promotora attributes were based on participants' descriptions obtained during the follow-up interview. Number of visits was based on participants' recall of the number of times the *promotora* spoke about pesticide safety. Professionalism was based on 5 questions about the *promotora*'s behavior during lessons (eg, ever late). The promotora was considered to have high professionalism if all 5 questions were answered as positive. Perceived effectiveness was assessed with a single item, with response options ranged from not at all effective (1) to extremely effective (4). Responses were dichotomized such that "very effective" or "extremely effective" were coded 1, zero otherwise. Continuity was based on whether participants had the same *promotora* throughout the intervention, or if they had more than one. Promotoras' adherence to the protocol was assessed by asking participants whether they had received 2 of the more challenging activities: one demonstrated the concept of pesticide residue associated with drift, and the other was a mapping exercise to identify locations of pesticides in the home from a child's perspective. Promotoras were classified as having provided both activities, one of the 2 activities, or neither of the activities.

Analyses

Descriptive statistics were calculated for each measure (pesticide-related safety behavior, conceptual targets, participant involvement in the program, *promotora* attributes, and adherence to training activities) at the pre- and posttest times as well as the difference between time points (post-pre). A series of linear regression models were fit to examine the association between individual predictor variables and the post-pre change scores for each set of pesticides safety behavior outcomes. Finally, an additional set of incremental models was fit for each pesticide safety behavior outcome. Each additional model's overall R^2, the amount of additional variance that was explained (ΔR^2) by each model compared to the pretest only model, and the corresponding *p*-value were calculated to test whether the additional variables improved outcome prediction. All analyses were done using SAS 9.2 (SAS Institute, Cary, NC).

RESULTS

Sample Characteristics

Complete pre- and posttest data were obtained from 610 individuals. Over half of the sample was 30 years of age or older. Over a quarter of the sample reported having fewer than 5 years of formal education, whereas only 11.6% reported completing 12 or more years of schooling (Table 1). Nearly all participants were born in Mexico, and most (54%) had been living in the United States for 9 or fewer years, although 46% had been in the United States for 10 or more years. Over 80% of participants were currently married or living as married, just under one-third currently had one child or was pregnant at the time of enrollment, whereas a comparable percentage had 2 children, and the remainder had 3 or more children. Most participants expressed the greatest comfort speaking Spanish.

Program Effectiveness and Implementation

Each type of pesticide-related safety behavior improved from pre- to posttest (Table 2). Increases were also noted for each of the conceptual targets: the score of pesticide knowledge increased from an average of 4.2 (SD = 2.7) to 12.5 (SD = 2.9); the average response for perceived dangerousness of pesticides increased from 3.45 (SD = 0.9) to 3.75 (0.5); and the pesticide safety self-efficacy average increased from 0.95 (SD = 0.6) to 1.37

(SD = 0.6). Over 60% of participants reported engaging with the written materials left behind by the *promotora*, whereas 87.2% reported watching the provided videos.

In terms of *promotora* attributes, participants reported having an average of 5 lessons (SD = 0.73), over 85% of participants indicated that the *promotora* demonstrated high professionalism, and nearly 95% of participants believed the *promotora* was effective. Virtually all participants had the same *promotora* throughout the educational phase of the program, and 91.5% of participants (N = 558) received both the residue demonstration and the pesticide mapping, believed to be key training activities. A small number of participants (N = 38, 6.2%) received either the residue demonstration or the pesticide mapping activities (but not both). Only 14 (2.3%) individuals did not receive either of these activities.

Disaggregating Sources Of Behavior Change

Change in pesticide knowledge was the only conceptual target associated with greater use of IPM practices (Table 3, column 1 and 2): change in both perceived dangerousness of pesticides and pesticide safety self-efficacy were unassociated with this outcome. Several participant attributes were associated with increased use of IPM practices from pre- to posttest. Participant educational attainment, language preference, years in the United States, and self-reported engagement with written materials were all associated with changes in participants' use of IPM activities. None of the *promotora* attributes were associated with change in IPM.

Increased use of WPS recommendations from pre-to posttest was associated with changes in both pesticide knowledge and perceived dangerousness of pesticides. Change in adherence to WPS recommendations did not differ by any of the participant attributes, except self-reported extra review of video material that was associated with less change in this outcome. None of the *promotora* attributes were associated with change in WPS recommendations. Change in the safe storage of pesticides in the home was not predicted by any factor.

Pre- to posttest change in the conceptual targets explained the most variance in participants' use of IPM (Table 4). Collectively, changes in the conceptual targets of the intervention accounted for 6% of participants' posttest use of IPM, controlling for pretest values of IPM. By contrast, personal attributes and *promotora* attributes each accounted for approximately 3% of the variance in this behavioral domain. Changes in adherence to WPS recommendations were most influenced by *promotora* attributes ($\Delta R^2 = 0.02$) followed by personal attributes ($\Delta R^2 = 0.01$). Changes in the targeted conceptual levers did not explain any additional variance beyond the pretest-only model. Change in the conceptual targets added significantly to model fit of safe storage of pesticides in the home ($\Delta R^2 = 0.02$), whereas both personal and *promotora* attributes did not explain any change in this outcome.

DISCUSSION

This study sought to disaggregate the relative influence of 3 sets of factors: appropriateness of the conceptual targets or theoretical levers for behavior change, basic capacities of the intervention audience, and attributes of the intervention vehicle, on behavior change resulting from a pesticides safety intervention delivered to immigrant Latino families in the farmworker community. The value of disaggregating the sources of behavior change lies in its ability to inform how the intervention may need to be modified as it is translated from a highly controlled research context to public health practice. These results make several contributions to the literature.

First, the conceptual targets by the intervention provided the greatest explanation for behavior change. The block of variables containing changes in pesticide knowledge, perceived dangerousness of pesticides, and pesticide self-efficacy explained the greatest amount of posttest use of IPM and safe storage of pesticides, controlling for pretest values. These results are consistent with standard recommendations that interventions be built upon a solid theoretical foundation.[2] However, it is noteworthy that the conceptual levers explained only a very small amount of variance in behavior change, only 6% of the variance in use of IPM and less than 2% of the variance in safe storage of pesticides. Although meaningful and potentially attenuated by measurement error,[11] additional research is needed to identify whether alternative conceptual targets may do a better job of explaining pesticide safety behavior. There are several candidates for alternative conceptual targets or pesticide safety interventions. Participants' beliefs that advocated behaviors effectively mitigate or eliminate the health threat, like pesticide exposure is one viable conceptual target supported by the Health Belief Model and other theories (eg, Protection Motivation Theory[12]). Other conceptual targets worthy of future research are the extent to which individuals believe they are personally susceptible to health threats from pesticide exposure and the personal or familial severity of the health-related consequences of pesticide exposure.

Second, attributes of the intervention vehicle, in this case the *promotora*, are meaningful contributors to the amount of behavior change elicited by an intervention. The *promotora* attributes explained 2.8% of the variance in changes in the use of IPM and 1.9% of the variance in changes in adherence to WPS recommendations. Although modest, these findings reinforce the importance of careful selection and oversight of *promotoras* in future projects using lay health advisors.[13] Post hoc analyses (not shown) suggest that *promotora* oversight is important because the number of visits was a robust predictor of both change in use of IPM and adherence to WPS recommendations, and delivery of key content predicted change in use of IPM. Thus, oversight is important to enhance overall adherence to lesson guidelines. Selection criterion are also important because post hoc analyses (not shown) indicated that greater perceived effectiveness was associated with change in use of IPM, and *promotora* continuity was associated with change in adherence to WPS. Thus, selecting (and possibly training) *promotoras* who can effectively deliver material and stay engaged in the program is associated with enhanced intervention outcomes. As reliance on lay health advisors and other community health workers increases,[14,15] more empirical attention will need to be given to discerning factors that enhance their effectiveness.

Third, participants' attributes had little influence in shaping change in pesticide safety behaviors. Personal attributes explained 1–3% of the change in use of IPM and adherence to WPS recommendations; however, most of this variance is attributed to participant language: behavior change for both outcomes was lower for individuals for whom Spanish was a second language. The *La Familia Sana* program was developed in Spanish because the vast majority of farmworkers are from Mexico and speak Spanish.[16] Nevertheless, an increasing number of farmworkers are from rural areas of Mexico and Central American where indigenous languages are spoken, thereby necessitating the creation of health and safety materials in languages other than Spanish.[17–19] As the *La Familia Sana* is disseminated, it will be important to create alternative versions in various indigenous languages, such as Mixteco or Trique. The language issue notwithstanding, the relative independence of personal attributes to behavior change is valuable because it suggests the program can be widely distributed without concern that demographic differences in target populations will produce large differences in the program's success.

The results of this study need to be considered in light of its limitations. These results are based on data from a nonrandom sample of participants in one discrete region of North Carolina; consequently, the generalizability of study findings is unknown. This evaluation took a relatively modest approach in evaluating the relative contributions of conceptual targets, personal attributes, and *promotora* attributes. Interactive effects are likely to be relevant as well. For example, the combination of recent arrival to the United States, along with being an indigenous language speaker, matched with an ineffective *promotora* would likely undermine program effectiveness. Our study was not designed or powered to test such effects, but it is an area worth greater research attention. Finally, some of the measures used in this study are less than optimal; however, more rigorous measures would not have fit with a study designed primarily as an evaluation of a minimally controlled demonstration project.

Limitations notwithstanding, the results of this study offer insight into strategies for ensuring effective dissemination of health and safety interventions into public health practice. Our results demonstrate that changes to conceptual targets of the intervention explained the greatest amount of change in 2 of the 3 behavioral outcomes, reinforcing the necessity of building public health interventions on solid theoretical foundations. Results also highlight the importance of considering attributes of the intervention vehicle, in this case *promotora* attributes. These results emphasize the importance of both selection and oversight of personnel when designing and implementing a lay health advisor intervention. Finally, and more specific to one area of health education, the results contribute to the pesticide safety education literature. That is, with the notable exception of participant language, difference in the target populations or *promotora* attributes are not expected to contribute to substantial variation in the effectiveness of the *La Familia Sana* program.

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Table 1

Sample Descriptive Statistics (N = 610)

	N	%
Female[a]	**592**	**97.2**
Age[a]		
15–24	111	22.1
25–29	128	25.5
30–34	119	23.7
35+	144	28.7
Education		
≤ 5 grade	164	26.9
6–8 grade	211	34.6
9–11 grade	164	26.9
≥12 grade	71	11.6
Country of Birth		
United States	13	2.1
Mexico	563	92.3
Other	34	5.6
Years Lived in US[a]		
≤ 4	81	14.6
5–9	218	39.4
10+	255	46.0
Married (or living as married)[a]	469	84.1
Number of Children in Household		
0 (pregnant woman)	10	1.6
1	174	28.5
2	189	31.0
3	146	23.9
4+	91	14.9
Language of Greatest Comfort		
English	24	3.9
Spanish	542	88.9
Mixteco	38	6.2
Other	6	1.0

Note.

[a]There are missing observations; percentages were calculated using the number of valid observations.

Table 2

Descriptive Statistics[a] for Pesticide-related Safety Behavior, Conceptual Targets of the Intervention, Personal Involvement in the Program, and *Promotora* Attributes (N = 610)

	M	SD	Minimum	Maximum
Pesticide-related Safety Behavior				
Use of Integrated Pest Management				
Pretest % correct	55.11	20.93	0	90
Posttest % correct	63.0	18.66	10	100
Post-Pre change	7.90	21.76	−70	70
Adherence to WPS Recommendations[b]				
Pretest % correct	67.23	20.7	0	100
Posttest % correct	77.26	13.84	25	100
Post-Pre change	10.07	22.12	−50	100
Safe Home Storage of Pesticides				
Pretest % correct	76.49	24.56	0	100
Posttest % correct	85.84	20.76	0	100
Post-Pre change	9.34	29.11	−100	100
Conceptual Targets of the Intervention				
Pesticide Knowledge (0–17)				
Pretest sum	4.16	2.68	0	16
Posttest sum	12.46	2.91	2	17
Post-Pre change	8.31	3.42	−2	16
Perceived Dangerousness of Pesticides (1–4)				
Pretest	3.45	0.86	1	4
Posttest	3.75	0.49	1	4
Post-Pre change	0.30	0.86	−3	3
Pesticide safety self-efficacy[b]				
Pretest average score	0.95	0.62	0	2
Posttest average score	1.37	0.64	0	2
Post-Pre change	0.41	0.75	−2	2
Participant Involvement in the Program				
Reported engagement with written material [n(%)][b]	382	62.8		
Extra review of video material [n(%)][b]	525	87.2		
***Promotora* Attributes**				
Number of visits	5.02	0.73	1	7
High professionalism [n(%)]	524	85.9		
High perceived effectiveness [n(%)]	577	94.6		
Continuity [n(% with only 1 *promotora*)]	602	98.7		
Adherence to Training ctivities				
Received “residue” and “mapping” [n(%)]	558	91.5		
Received “residue” or “mapping” (but not both) [n(%)]	38	6.2		

	M	SD	Minimum	Maximum
Received neither “reside” or “mapping” [n(%)]	14	2.3		

Note.

[a]Mean, SD unless otherwise noted

[b]Missing observations

Table 3

Bivariate Association[a] of Predictors With Change in Pesticide Safety-related Behavior

	Change in Use of IPM Strategies		Change in Adherence to WPS Recommendations		Change in Safe Storage of Pesticides in Home	
	b(se)	p value	b(se)	p value	b(se)	p value
Conceptual Targets of the Intervention						
Post-pre change in pesticide knowledge	0.89(0.26)	.0006	0.64(0.26)	.0160	0.07(0.34)	.8380
Post-pre change in perceived dangerousness of pesticides	−0.71(1.03)	.4938	2.11(1.06)	.0475	0.11(1.38)	.9369
Post-pre change in pesticide safety self-efficacy	0.87(1.17)	.4564	1.25(1.19)	.2936	−1.17(1.57)	.4540
Participant Attributes						
Age		.6451		.6830		.5071
15–24	−0.21(2.72)		2.66(2.78)		−3.98(3.63)	
25–29	2.67(2.61)		2.90(2.68)		−1.15(3.49)	
30–34	−0.30(2.66)		2.25(2.73)		−4.69(3.56)	
35+	REF		REF		REF	
Education		.0360		.6330		.8876
<= 5 grade	0.52(3.08)		1.01(3.15)		0.41(4.14)	
6–8 grade	2.70(2.97)		2.14(3.04)		2.07(4.00)	
9–11 grade	6.81(3.08)		3.56(3.15)		2.36(4.14)	
12+ grade	REF		REF		REF	
Language Preference		.0053		.5624		.4174
English	1.62(9.85)		10.42(10.11)		−0.83(13.29)	
Spanish	7.28(8.86)		5.96(9.09)		6.70(11.95)	
Mixteco	−4.82(9.48)		3.07(9.73)		1.40(12.79)	
Other	REF		REF		REF	
Years in the US		.0476		.1511		.1229
< = 4	3.47(2.70)		4.30(2.80)		−7.28(3.71)	
5–9	4.73(1.95)		3.32(2.02)		−0.25(2.68)	
10+	REF		REF		REF	
Reported engagement with written material	8.49(1.79)	<.0001	−2.08(1.87)	.2660	1.50(2.44)	.5381
Extra review of video material	4.11(2.66)	.1225	−6.84(2.69)	.0114	0.02(3.57)	.9954

	Change in Use of IPM Strategies		Change in Adherence to WPS Recommendations		Change in Safe Storage of Pesticides in Home	
	b(se)	p value	b(se)	p value	b(se)	p value
***Promotora* Attributes**						
Number of visits	0.63(1.22)	.6027	−1.67(1.23)	.1766	2.67(1.62)	.1002
High professionalism	1.64(2.53)	.5174	2.58(2.58)	.3161	3.03(3.39)	.3719
High perceived effectiveness	1.37(3.90)	.7254	−1.37(3.96)	.7293	2.83(5.21)	.5873
Continuity (1 = only 1 promotora)	−2.13(7.75)	.7833	10.20(7.87)	.1954	14.53(10.35)	.1608
Adherence to Training Activities						
Received both “residue” and “mapping”	2.78(3.16)	.3788	1.02(3.21)	.7511	3.91(4.22)	.3548
Received either “residue” or “mapping”	0.81(5.89)	.8906	2.99(5.99)	.6173	11.03(7.86)	.1614
Received neither “residue” nor “mapping”	REF		REF		REF	

Note.

[a]Each parameter estimate (or set of parameter estimates) for a given variable was obtained from a linear regression model containing only that variable as a predictor

Table 4

Explained Variance and Changes in Explained Variance in Pesticide Safety-related Behaviors Attributed to Changes in the Conceptual Targets of the Intervention, Personal Attributes, and *Promotora* Attributes

	R^2	ΔR^2	p value
Change in Use of IPM Strategies			
Pretest-only model[a]	0.3828		<.0001
Pretest plus conceptual target model[b]	0.4440	0.0612	<.0001
Pretest plus personal attributes model[b]	0.4084	0.0256	.0002
Pretest plus *promotora* attributes model[b]	0.4109	0.0281	<.0001
Change in Adherence to WPS Recommendations			
Pretest-only model[a]	0.6318		<.0001
Pretest plus conceptual target model[b]	0.6363	0.0045	.0736
Pretest plus personal attributes model[b]	0.6455	0.0137	.0078
Pretest plus *promotora* attributes model[b]	0.6504	0.0186	.0165
Change in Safe Storage of Pesticides in the Home			
Pretest-only model[a]	0.5084		<.0001
Pretest plus conceptual target model[b]	0.5273	0.0189	<.0001
Pretest plus personal attributes model[b]	0.5296	0.0212	.9327
Pretest plus *promotora* attributes model[b]	0.5134	0.0050	.3837

Note.

[a] p-value for pretest-only model is the overall p-value for the model.

[b] overall models R^2, the amount of additional variance that was explained by each model compared to the pretest-only model (ΔR^2), and the corresponding p-value to test whether collection of additional variables significantly improved the prediction of the outcome, after adjusting for the pretest value